## CLAIMS

What is claimed is:

1. A resistive composition, based on total composition, comprising:

a) 5-30 wt. % of polymer resin;

b) 10-30 wt. % conductive particles selected from the group consisting of carbon black, graphite, silver, copper, nickel and mixtures thereof;

c) 0.01 –10 wt% zirconia particles; and

d) a 60-80 wt. % organic solvent, wherein the polymer resin, conductive particles, and zirconia particles are dispersed in the organic solvent

2. The resistive composition of claim 1 further comprising: 0.025-20 wt. % nanoparticles.

3. The resistive composition of claim 1 further comprising: 1-20 wt. % fluropolymer.

4. The resistive composition of claim 1 wherein the polymer resin is chosen from the group consisting of polyimides, polyamide imides, polysulfones, polyphenylenes, polyether sulfones, polyarylene ethers, polyphenylene sulfides, polyarylene ether ketones, phenoxy resins, polyether imides, polyquinoxalines, polyquinolines, polybenzimidazoles, polybenzoxazoles, polybenzothiazoles, phenolic, epoxy and diallyll isophthalate.

5. The resistive composition of claim 1 wherein the conductive particles are selected from the group consisting of carbon black, graphite, silver, copper, nickel and mixtures thereof.

6. The resistive composition of claim 1 further comprising greater than 0 up to and including 10 wt. % of a thermosetting resin.

7. The resistive composition of claim 6 wherein the thermosetting resin is selected from the group consisting of aromatic cyanate ester, epoxy, phenolic, diallyl isophthalate and bismaleimide.

8. The resistive composition of claim 2 wherein the nanoparticles are chosen from the group consisting of nanotubes, nanofibers and mixtures thereof.

9. The resistive composition of claim 2 wherein the nanoparticles include 0.1-5 wt. % of molecular silica.

10. The resistive composition according to claim 9, wherein the molecular silica has a particle size less than 100 nanometers.

11. The resistive composition of claim 2 wherein the nanoparticles include 0.1-5 wt. % of nanoclay.

12. The resistive composition according to claim 11, wherein the nanoclay has a particle size less than 100 nanometers in one dimension.

13. The resistive composition of claim 2 wherein the nanoparticles are carbon nanotubes which constitute 1-7 wt. % of the resistive composition.

14. The resistive composition according to claim 1, wherein the zirconia particles have a particle size between 100 nm and 10 micron.

15. The resistive composition according to claim 13, wherein the carbon nanotubes have a particle size less than 100 nanometers in one dimension.

16. The resistive composition according to claim 13, wherein the carbon nanotubes are vapor grown and have a particle size range of 50 nanometers to 10 microns in one dimension.

17. The resistive composition according to claim 2, wherein the carbon nanoparticles are milled carbon fibers that have a particle size range of 100 nanometers to 10 microns in one dimension.

18. The resistive composition of claim 2 wherein the nanoparticles are selected from the group consisting of vapor grown carbon nanofibers, milled carbon fibers and mixtures thereof.

19. The resistive composition according to claim 1, wherein the resistive composition is applied to a substrate, the substrate being selected from the group consisting of polyimide, ceramic, FR-4, and fiber reinforced phenolic substrates.

20. The resistive composition according to claim 1, wherein the organic solvent is selected from the group consisting of: N-methyl pyrrolidone, diallyl pthalate, glycol ether and dimethyl formamide.

21. The resistive composition according to claim 1 wherein the polymer resin comprises 15-20 wt. % of the resistive composition.

22. The resistive composition of claim 1 wherein the conductive particles comprise 15 - 20 wt. % of the resistive composition.

23. The resistive composition of claim 1 wherein the nanoparticles comprise 0.1-7 wt. % of the resistive composition.

24. The resistive composition of claim 1 wherein the zirconia particles comprise 0.01 - 3.0 wt. % of the resistive composition.

25. A method of forming a variable resistive element comprising:

a) preparing a resistive composition by:

forming a polymer solution by mixing at least a polymer resin and an organic solvent;

mixing the polymer solution with conductive particles and zirconia particles to form a paste;

b) applying the resistive composition to a substrate; and

c) curing the resistive composition on the substrate.

26. The method of claim 25, further comprising:

adding at least one of surfactants and rheological additives to the polymer solution in preparing the resistive composition.

27. The method of claim 25, further comprising:

adding nanoparticles to the polymer solution in preparing the resistive composition.

28. The method of claim 25, further comprising:

applying the resistive composition to a film thickness of approximately 40 microns on the substrate.

29. The method of claim 25, further comprising:

mixing the polymer solution with the conductive and zirconia particles through ball milling.

30. The method of claim 25, further comprising:

monitoring a viscosity of the paste; and

controlling the mixing based on the viscosity.

31. An applied film comprising:

a) 40-80 percent by weight of a cured polymer resin;

b) 10-35 percent by weight of conductive particles selected from the group consisting of carbon black, graphite and mixtures thereof; and

c) .01 -11 wt. percent by weight of zirconia particles.

32. The film according to claim 31 further comprising: .025 -20 wt. percent nanoparticles.

33. The film according to claim 31 wherein the film is applied to a substrate.

34. The film according to claim 33 wherein the film is adapted to be contacted by a wiper thereby forming a variable resistor.

35. The film according to claim 31 further comprising: 2.0 - 4.0 wt. percent zirconia.